CLAIMS

1. (Original) A multiband loop antenna, for use with a communication device, operating for exchanging energy in bands of radiation frequencies, comprising,

connection means having first and second conductors for conduction of electrical current,

two or more radiation loops wherein,

each loop includes a plurality of electrically conducting segments, each segment having a segment length, where the segments are electrically connected in series between said first and second conductors for exchange of energy in a band of said radiation frequencies, said loop having an electrical length, A_l that is proportional to the sum of segment lengths for each of said segments, and where said segments are arrayed in an irregular compressed pattern,

said loops are nested together whereby the area of one of said loops is within an area enclosed by another of said loops.

2. (Original) The loop antenna of Claim 1 wherein said first and second conductors of said connection means include first and second tangs, respectively.

3. (Original) The loop antenna of Claim 2 wherein said first and second tangs exhibit the same spring compression for making balanced electrical connection to first and second pads at ends of one or more of said loops.

4. (Original) The loop antenna of Claim 1 wherein said connection means includes two compressible metal tangs that have balanced spring compression for making electrical connection to said loops.

5. (Original) The loop antenna of Claim 1 wherein each of said loops have first and second termination points where said first termination point for each of said loops connects in common at a first pad, where said second termination point for each of said loops connect in common at a second pad and where said first pad and second pad connect as part of said first and second conductors, respectively, for conduction of electrical current through said loops.

6. (Original) The loop antenna of Claim 1 wherein said loops are on different layers separated by a dielectric.

7. (Original) The loop antenna of Claim 1 wherein one or more of said radiation loops is on one layer mounted on a dielectric material and one or more other ones of said radiation loops is on a different layer mounted on said dielectric material.

8. (Original) The loop antenna of Claim 1 wherein said loops are nested on the same layer supported by a dielectric substrate.

9. (Original) The loop antenna of Claim 1 wherein ones of said segments are arrayed in multiple divergent directions not parallel to an orthogonal coordinate system so as to provide a predetermined antenna electrical length while enabling the said loop to fit within an established antenna area of said communication device.

10. (Original) The loop antenna of Claim 1 wherein said radiation loop has an irregular shape and wherein said segments are arrayed in an irregular pattern.

11. (Original) The loop antenna of Claim 1 wherein said segments are formed of conductive traces on a flexible dielectric substrate.

12. (Original) The loop antenna of Claim 1 wherein said radiation loops transmit and receive radiation.

13. (Original) The loop antenna of Claim 1 wherein one or more of said radiation loops transmit and receive in a US PCS band operating from 1850 MHz to 1990 MHz.

14. (Original) The loop antenna of Claim 1 wherein one or more of said radiation loops transmit and receive in a European PCS band operating from 1710 MHz to 1880MHz.

15. (Original) The loop antenna of Claim 1 wherein one or more of said radiation loops transmit and receive in a European GSM band operating from 880 MHz to 960 MHz.

16. (Original) The loop antenna of Claim 1 wherein said radiation loops transmit and receive in mobile telephone frequency bands operating anywhere from 800 MHz to 2400 MHz.

17. (Original) The loop antenna of Claim 1 wherein a first one of said radiation loops is nested within a second one of said radiation loops and wherein said first one and said second one of said radiation loops are different in lengths by amounts that establish radiation frequencies that partially overlap and produce combined radiation frequencies for said first one and said second one of said radiation loops to establish a combined bandwidth greater than a bandwidth for either said first one and said second one of said radiation loops alone.

18. (Original) The loop antenna of Claim 1 wherein one or more of said radiation loops is on one layer mounted on a dielectric material and one or more other ones of said radiation loops is on a different layer mounted on said dielectric material.

19. (Original) The loop antenna of Claim 1 wherein a first one of said radiation loops is on one layer mounted on a dielectric material and where a conductive region is on a different layer mounted on said dielectric material juxtaposed said first one of said radiation loops.

20. (Original) The loop antenna of Claim 1 wherein a first one of said radiation loops is nested within a second one of said radiation loops and wherein said first one and said second one of said radiation loops are different in lengths by amounts that establish radiation frequencies that partially overlap and produce combined radiation frequencies for said first one and said second one of said radiation loops to establish a combined bandwidth greater than a bandwidth for either said first one and said second one of said radiation loops alone.

21. (Original) The loop antenna of Claim 1 wherein one or more first ones of said radiation loops and one or more said second ones of said radiation loops are different in length by amounts that establish radiation frequencies that do not substantially overlap and thereby produce combined radiation frequencies for said first ones and said second ones of said radiation loops to establish first and second bands of said frequencies that are separated and do not substantially overlap.

22. (Original) The loop antenna of Claim 1 wherein a first one of said radiation loops is on one layer mounted on a dielectric material and where a conductive region is on a different layer mounted on said dielectric material juxtaposed said first one of said radiation loops whereby said a conductive region tunes said first one of said radiation loops.

23. (Original) The loop antenna of Claim 1 wherein said loops provide multi-band performance.

24. (Original) The loop antenna of Claim 1 wherein said bands of frequencies are not harmonically related.

25. (Original) The loop antenna of Claim 1 wherein one or more first ones of said radiation loops is on a first layer mounted on a dielectric material and one or more second ones of said radiation loops is on a second layer mounted on said dielectric material, where said first ones of said loops have first and second first-layer termination points connected in common to first and second first-layer pads, respectively, on said first layer and where said second ones of said loops have first and second second-layer termination points connected in common to first and second second-layer pads, respectively, on said second layer.

26. (Original) The loop antenna of Claim 25 wherein said first and second first-layer pads are juxtaposed said first and second second-layer pads, respectively, whereby said first ones of said radiation loops are electrically coupled to said second ones of said radiation loops.

27. (Original) The loop antenna of Claim 1 wherein first, second and third ones of said radiation loops is on a first layer mounted on a dielectric material wherein said first one of said radiation loops

is nested with an offset inside said first one of said radiation loops to establish first and second bands of said frequencies and wherein said third one of said radiation loops encloses said first and second radiation loops to establish a third band of said frequencies.

28. (Original) The loop antenna of Claim 27 wherein third and fourth ones of said radiation loops is on a second layer mounted on said dielectric material wherein said third and fourth ones of said radiation loops are mirror images of and are juxtaposed said first and second ones of said radiation loops.

29. (Original) The loop antenna of Claim 28 including a conductive region juxtaposed said third one of said radiation loops for tuning said third radiation loop.

30. (Original) The loop antenna of Claim 1 wherein a plurality of said radiation loops have first and second termination points connected in common to first and second pads, respectively, where said first and second pads are the only electrical connections for said plurality of said radiation loops to a transceiver unit in said communication device.

31. (Original) The loop antenna of Claim 30 wherein said first and second first-layer pads are juxtaposed said first and second second-layer pads, respectively, whereby said first ones of said radiation loops are electrically coupled to said second ones of said radiation loops.

32. (Original) The loop antenna of Claim 1 wherein each of said loops performs with loop antenna operation to establish low SAR for said loop antenna.

33. (Original) A communication device operating for exchanging energy in bands of radiation frequencies, comprising,

a case for housing the communication device,

connection means for mounting internal to said case for conduction of electrical current,

a loop antenna formed of two or more radiation loops wherein,

each loop includes a plurality of electrically conducting segments, each segment having a segment length, where the segments are electrically connected in series to said connection means to form a loop antenna for exchange of energy in one of said bands of radiation frequencies, said loop having an electrical length, A_t that is proportional to the sum of the segment length for each of said segments, and where said segments are arrayed in a compressed pattern,

said loops are superimposed whereby an area enclosed by one of said loops covers an area enclosed by another of said loops.

34. (Original) The communication device of Claim 33 wherein said loop antenna is installed inside said case.

35. (Original) The communication device of Claim 34 wherein said communication device is a mobile telephone.

36. (Original) The communication device of Claim 34 wherein said loop antenna is installed on said case with an adhesive.

37. (Original) The communication device of Claim 34 wherein said loop antenna is molded into said case.